SMITHSONIAN DEPOSIT

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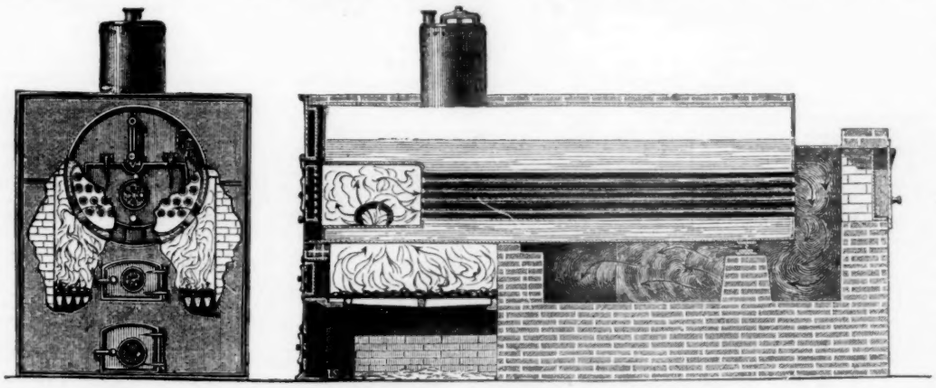
Lowe's Patent Improved Tubular and Flue Boilers.

The patentee desires to call your attention to, and consideration of, the merits of the above boiler.

The construction and manner of working Lowe's boilers meet more perfectly the requirements for perfect combustion of the gases of the fuel than any heretofore known, and the greatest amount of the volatile constituents of any fuel is utilized by this invention, and no free carbon escapes combustion; consequently there is no black smoke from the chimney with any fuel.

A better diffusion of the heat, and a more perfect consumption of the products of combustion are obtained in Lowe's boilers, than in any yet introduced, and an examination of the working of these boilers will convince any one that this statement is correct.



LOWE'S PATENT IMPROVED TUBULAR AND FLUE BOILER,

The above engraving represents a tubular boiler, constructed with Lowe's improvements; also shows the manner of setting these boilers. As this kind of boiler is ordinarily constructed, the fire is made upon the grate, and the products of combustion pass beneath the boiler to the back end, and return through the tubes or flues to the front end, the tubes or flues in such cases extending entirely through the boiler, a proper and complete combustion of the gases of the fuel cannot be obtained in that manner, a large portion of the heat thus generated is absorbed by the walls, and escapes through the unavoidable expansion cracks of the setting, and a large portion of the combustible gases pass off unconsumed, because they are not and cannot, properly, be supplied with the requisite quantity of oxygen, while in the most highly heated state.

The operation is as follows: The volume of heat and gases arising from the fuel divides into two volumes, and the motion of these volumes is accelerated by having to pass through the apertures into the chamber, which apertures are but one-eighth the area of half the grate; therefore they meet in the chamber in quick moving opposing currents, and the conflict in the chamber retards and disturbs them, so that the gases can be supplied with the requisite quantity of oxygen, through the perforated plate in the chamber door, and more perfect combustion ensues, and a blaze passes through the tubes or flues, instead of a current of unconsumed gases.

It is now admitted by the leading steam engineering talent of the world, that the limit of economy of steam by expansion in many of the modern steam engines, is fully attained; therefore, any further economy of fuel must be obtained from the boiler or generator.

During the past four years, nearly 100 of these boilers have been made, most of which are in use, and giving the most satisfactory results, both to maker and purchaser, and we have permission to refer to any of the owners of these boilers. Many of them have ordered more of these boilers, being convinced that they are the best known.

For circulars and information, address the patentee and manufacturer, WILLIAM LOWE, 93 Liberty street, New York.

New Kind of Burning Fluid—How is This for High.

Mr. Gray, of Boston, recently discovered a non-explosive illuminating fluid. To show how safe the new compound was, he invited a number of his friends to meet him in his rooms, whither he had brought a barrel of the fluid, which he at once proceeded to stir with a red-hot poker. As he went through the roof, accompanied by his friends, he endeavored to explain to his nearest companion that the particular fluid in the barrel had too much benzine in it, but the gentleman said he had engagements higher up, and could not wait for the explanation. Mr. Gray continued his ascent until he met Mr. Jones, who informed him that there was no necessity for him to go up higher, as everybody was coming down; so Mr. Gray started back to be with the party. Mr. Gray's widow offers for sale the secret for the manufacture of the non-explosive fluid at a reduced rate, as she wishes to raise money enough to buy a silver-handled coffin with a gilt plate for Mr. Gray.—*Exchange.*

THE GAS COMPANIES WAR.—A suit is pending in a court of this city, involving the fortunes of individuals and those of a gas company. It is not our province to intervene at this juncture, or do aught that might prejudice the rights of either party. Therefore we have not only declined to publish communications, but have recently said nothing on the subject. The contest between the companies will last for some time—how long none can tell. It is very certain that the price of gas will be greatly reduced, and we expect to illuminate the *Appeal* office at one dollar per thousand feet, before the gas war ends. Meanwhile profitable modes for utilizing the patent for the manufacture of gas from naphtha, and of making a perfect light at the least cost, will be employed by the old company, and it is asserted that the public shall have no reason, in future, for any complaints because of the quality or illuminating power of the gas furnished.—*Memphis Appeal.*

IT IS SAID the line of gas lights in the Petersburg and Clarion river oil districts extend for over twenty miles—almost from Lawrenceburg, in the Parker District to East Sandy. Of a clear night the sight presented is a beautiful one, reminding a person of the camp fires of an immense army spread out for miles and miles before him.—*Petroleum Centre Record.*

Chemical Repertory,
No. 63.—January 16, 1872.
EDITOR—HENRY WURTZ.

CHEMICAL EXCERPTS.

148. SALERATUS FOR LIFE-BUOYS.—A self-inflating life-preserver has been devised in Belgium, consisting of a belt containing carbonate of soda and tartaric acid, so arranged that, when the wearer falls overboard, the two substances are mixed and evolve sufficient gas to float him. The idea is said to have been suggested by a shipwrecked apothecary, whose life was saved by the circumstance of his having a box of Seidlitz powders in his pocket.—*Am. Artizan.*

[“Sarkazzum,” truly.—ED.]

149. RUBBER “NIPPLES” FOR NURSE-BOTTLES.—Prof. Gunning, the government analyst at Amsterdam, writes: “I object to the infants’ feeding bottles in all instances, when any part of them is composed of caoutchouc or india-rubber, or any like material. There is nothing so ill-suited to the constitution of the human body as the material in question. When, in consequence of suction, the pores of the caoutchouc are enlarged, some portion of the milk always remains behind in them, which cannot, or at least, cannot without great difficulty, be removed. This milk quickly becomes bad, and spoils the fresh milk with which it comes in contact.

The caoutchouc material in question is made up of several ingredients. White zinc, or white lead is very commonly employed, which is very poisonous. My objections are not founded conclusively on *a priori* conclusions. In this country many fatal cases have happened among infants, which on solid grounds, may be ascribed to the use of these bottles.”—*Am. Chem.*

150. THERMOCHEMICAL FACTS.—M. Favre.—All the crystallized anhydrous salts generate on being dissolved in water, cold; while the crystallized hydrated salts cause the evolution of heat, when becoming dissolved inwater.—*Les Mondes.*

151. A SERIO-COMIC (?) EXPLOSION.—[Our friends in the oil-districts are so accustomed to *making light* of dangerous products, that they have come to look upon such trifles as the following in a jocose mood. We quote from the Titusville *Courier.*]

An explosion of a wagon load of benzine occurred on the Church Run Road on last Saturday. The driver of the team was sitting on one of the barrels driving his horses along and at the same time smoking a pipe. He emptied the pipe when he was through smoking upon the head of the barrel he was using for a seat. In an instant a terrific explosion took place, and he was thrown to the distance of about a thousand yards into an adjoining forest, with the velocity of a cannon ball. He lodged in the top of a tall oak, where he took a rest before attempting to descend. When he afterward undertook to move, he discovered that his body was very badly shattered. With great effort he descended to the ground, and walked rapidly to Titusville where his wounds were properly dressed. He is now about as well as ever, having been thoroughly repaired by the use of a new and powerful adhesive salve. Three barrels of the benzine were blown forward under the horses where they exploded.

As might be expected this unusual noise frightened the high-spirited animals, and they kicked, reared and plunged, rather worse than they would even in fly-time. The manes and tails of the noble animals were badly scorched, but otherwise they are not seriously injured. Take it all in all it was one of the most thrilling accidents that has occurred in the oil regions for a long number of years. Although the horses, no doubt, thought that absence of body would be far preferable to presence of mind, they kept very cool through the trying ordeal, and did everything they could to allay any excitement that the explosion might occasion. Their conduct is highly spoken of by all who witnessed the affair.

152. DETECTION OF PHENOL (CARBOLIC ACID) BY BROMINE.—Landolt.—While engaged in testing a well-water contaminated with gas liquor (ammoniacal water of a coal gas works), it occurred to the author to try to detect phenol in the well-water. After having vainly tried some of the more ordinary reagents of phenol, bromine-water was employed, and observed to yield, when added in excess to a portion of the well water, at once a yellowish-white precipitate of tribromphenol, which is very characteristic, and by expressly-made experiments with pure phenol, it renders 1 part discernible in 437,000 parts of water. 1 part of phenol in 571,000 parts of water does not immediately yield a precipitate, but after standing some time, crystalline tribromphenol makes its appearance. Phenol can only be detected by the peculiar odor when 1 part is present in 2800 parts of water. The author states that bromine-water may be used for the quantitative estimation of phenol, by collecting the preciptate of tribromphenol upon a previously weighed filter, and drying it over sulphuric acid. As the best means to test any well-water suspected to contain traces of gas-liquor, the author advises that a large quantity of the water should be first acidulated with sulphuric acid, then submitted to distillation, and the first quantity collected in the well-cooled receiver should be treated with bromine-water.—*German Chem. Society.*

153. COATING METALLIC OBJECTS WITH A BLACK-BROWN VARNISH.—Puscher.—On the bottom of a cylindrical cast-iron vessel, 18 inches high, is placed a layer, one-half inch thick, of coal-dust (bituminous of course); upon this is placed an iron grating, and thereon are put the iron, steel, or other metallic objects intended to be coated with the varnish. The vessel, having been first closed with a well-fitting lid, is next placed on a bright coke fire, and heated for about a quarter of an hour just to an incipient red heat. The vessel is then removed from the fire, and on the lid being removed, after about ten minutes, the metallic objects will be found coated very uniformly with a good and durable varnish, which resists bending, as well as a high temperature, without cracking or coming off. Very small objects, such as hooks-and-eyes for instance, are better placed along with some coal-dust in a coffee roasting apparatus, and this turned, as is usual in the roasting of coffee, until the metallic objects have obtained the desired depth of color and are uniformly coated with the varnish.—*Chemical News.*

154. ADULTERATION OF LARD.—Some time ago, the stock of prepared lard being exhausted, a quantity was procured from a respectable pork dealer. It was beautifully white; so much so, that the writer was led to question his ability to produce anything equal to it. The first trial was in preparing ointment of nitrate of mercury. The color, when the mercurial solution was added, was the reverse of citrine, indeed decidedly saturnine, developing in a short time to a full slate color. Surprised at this unprecedented result, the usual precautions having been taken as to temperature, etc., the lard was suspected, and on examination, was found to contain a large proportion of lime. Some time after, being in conversation with a lard-renderer, a hint was dropped as to the relation of lime to color, when the information was confidentially imparted that a common practice among lard dealers was to mix from two to five per cent. of milk of lime with the melted lard. A saponaceous compound is formed, which is not only pearly white, but will allow of the stirring in, during cooling, of 25 per cent. of water.—*Canada Paper.*

155. NEW YORK MILK.—Dr. Paul Schweitzer has communicated to the New York Lyceum of Natural History, that he has had occasion to analyse a very large number of specimens of milk, gathered by the sanitary inspectors of the Board of Health, and it was a satisfaction to hear him say that he had never found any other adulteration than water. The popular impression, that chalk, calves’ brains, and similar unappetizing impurities are added by milk dealers, appears to be erroneous. The chief results obtained by Dr. Schweitzer were as follows:

Normal milk has the specific gravity of 1·029, and contains from 12½ to 13 per cent. solid constituents. Two, out of numerous analyses, afforded:

Water	87·81	87·23
Butter	3·23	3·81
Casein (cheese)	3·57	3 71
Sugar	4·69	4 46
Ash	0·70	0·79

The best specimens of condensed milk gave: Water, 52·54; butter, 13·12; casein, 14·44; sugar, 16·30; ash, 2·60. In the preparation of the condensed milk, 430 quarts were condensed to 100, and the solid constituents increased from 12·55 to 46·46 per cent. These results appeared to warrant the suspicion that 378 quarts had been reduced to 100; but by making the correction, called for by the fact that the quart was a measure of volume while all the determinations were made by weight, the company were found to have actually started with 430 quarts to make 100 of the condensed article. The ashes of milk are rich in phosphates and alkalies.

156. ASPHALT ROADS IN PARIS.—It is stated that the authorities of Paris are about to give up the asphalt paving, and return to the old-fashioned stones, in consequence of the great expense of keeping up the asphalt. The determination of the former is not encouraging, but then it must be remembered that we are not quite so ready to use our paving-stones for the manufacture of barricades as they are.—*Van Nostrand.*

Accuracy of Dry Meters.

[In our last we promised extracts from the testimony of Mr. Charles Hermany, Engineer of the Louisville Water Works, before the Court, at Louisville, Kentucky. See editorial page, last issue. We now redeem our promise, omitting such most of what is merely descriptive of the construction and working of the meter, which would be superfluous to most of our readers—ED.]

The most satisfactory test of the accuracy of this instrument is to compare it with a prover, or an instrument to measure its capacity, an instrument so simple in its construction that we can not only comprehend it, but measure and verify it. We have a measure that contains a given number of cubic feet, and we bring that measure and this meter into direct communication. We let the prover represent the gas works and the connecting tube the ordinary main in the street. The meter is the ordinary meter used in public and private houses. The prover is filled with gas, the instrument is also filled. The dial is then moved to a given point. A given quantity of gas is allowed to pass through the instrument, say five cubic feet, which is ascertained by the scale on the prover. The moment the hand of the prover arrives at a point on the scale, which indicates that five cubic feet ought to be discharged, we stop off the flow of gas. We then examine the instrument to see if it corresponds with the prover. If five cubic feet is the test, and the indicator on the meter records five cubic feet, then we say the meter is correct. Why? Because we have taken it in its normal condition, and passed five cubic feet of gas through it from the prover, which *we know* to be correct, and the instrument has operated during this time and so recorded it. If the instrument has recorded less than five cubic feet we find that it is not correct, and we adjust it by elongating the arms of the crank, which causes the diaphragms to travel over a greater distance. If, on the other hand, the instrument records more gas than has passed through it, we correct it by shortening the crank. These corrections can only be made by trials—sometimes more in number, sometimes less. After we have adjusted the crank and tested the instrument by means of the prover, we say the meter is correct. I believe the allowance made for variation is three per cent. either way; that is, when the meter does not record more than three per cent. above or below the correct quantity, it is called commercially correct.

Question by Mr. Bijur—I will ask you whether you can make a test? Here are two meters which were connected with the Louisville Opera House. Can you test them?

Mr. Hermany: It is proper to state to the jury that the meter (the small Opera House meter, which he was proceeding to test) has been boxed up since June last, when it was taken out of the Theater, and the diaphragms may be a little stiff. It is not likely that the meter will indicate correctly, on this account, within one to two per cent. Secondly, on account of the wearing of the valves. Thirdly, from the fact that there may be a little play in the connections of the instrument, which has run so long, and measured gas between five and six years. This would be to the detriment of the gas company, however, because it would allow more gas to pass than was registered.

Here the small Opera House meter was attached to the prover, and the prover in turn attached to the gas pipe of the court room, for the purpose of testing the meter. The meter was then filled with gas preparatory to the test. Afterwards the record of the indicator being taken, and the flow of gas turned on at a water pressure of 1½ inches, the same as that used by the Gas Company, just at the time when the index hand of the prover showed that five cubic feet of gas had escaped from it through the meter the flow of gas was stopped off. The witness then proceeded:

You see, gentlemen, that the index hand of the prover indicates that just exactly five cubic feet of gas have passed from it. On looking at the indicator on the meter you find that it records the fact that just five cubic feet of gas have passed through it. I therefore pronounce the meter correct. I did not expect to find it so.

* * * * * * *

[Here Mr. Bijur broke and destroyed the glass over the indicator on the small Opera House meter, exposing the hands on the dial to the touch.]

Question by Mr. Bijur.—You have stated that the index was not subject to the control of any one; is it now?

Answer.—The action of the meter can not be effected in its present state any further than this: A skilful mechanic might go to work and loosen these hands, but the meter would tell its own story—it would bear evidence of violence. He could not move the hands unless he went further in the process of destruction. Forcibly turning the hands would not effect the working of the meter, but it would effect the record. The usual capacity of the best burners is estimated at six cubic feet per hour. They range from 3½ to 6 cubic feet per hour, but so far as the capacity of the burner is concerned in itself, it has nothing to do with the the consumption of gas, for the consumer may shut it off. The burner regulates the supply of gas, and the index records the gas the burner consumes. [Here witness took up the glass-covered meter.] I stated on Wednesday that, from the inlet-pipe, the gas passes the various compartments of the meter, and I ought to have stated that it first passes into a receiving chamber which corresponds exactly with the steam-chest of a steam engine, from which chest the steam is admitted into the cylinder by means of a slide valve. When the steam has been admitted into the cylinder, and has forced the piston from one end to the other, it can never return into the steam-chest. It returns through the same part into the condenser, or into the atmosphere. It cannot go back into the steam-chest; if it could, it could be driven back into the boiler, which is a manifest impossibility. The gas must go through the outlet pipe to the consumer. It makes no difference what the pressure is on the gas at the place of manufacture, it is under control of the consumer through the burner.

The consumption of gas depends upon three conditions: 1st. The pressure exercised on the pipes by the gas company. 2d. The capacity of those pipes for delivery. 3rd. The disposition of the consumer to use the gas or not as he pleases. To illustrate; the meter is the dividing line between the gas company and the consumer. I regard the meter as the impartial judge from there out. The gas is under the control of the gas company from the works to the meter; from the meter on, it is under the control of the consumer. For instance: So long as I keep my pipe closed—so long as I do not permit any of the gas to escape—the gas company may increase their pressure as they please. It does not affect me. Why? Because I do not permit the escape of any gas whatever, and consequently the meter records none.

[To be concluded.]

Gas Pokers.

It is a matter of frequent and true remark that inventions designed to facilitate minor and commonplace work, are not seldom the source of very great profit to their inventors. This is especially true of household appliances, from which, in one way and another, many a fortune has been made. It is somewhat singular, however, that so little has been done to obviate the trouble of kindling fires. There has, to be sure, been a large number of so-called fire kindlers brought forward during the past few years, some of them apparently very well adapted to the purpose for which they were designed; but aside from the little cakes of rosin and sawdust, sold four or five for a cent, there is no popular aid to, or substitute for, the old time kindling-wood and shavings. We have been led to mention this from noting among English patents issued nearly a score of years ago, an invention under the out-of-the-way title of a "gas poker," and which may serve as a hint to a device that, if it can be made to work well practically, should prove "a good thing" both to the inventor and to the fire-kindling public.

The "gas poker" was described as consisting of "a tube of iron or other metal, shaped like a common poker, the lower end being perforated with holes; the upper end furnished with a union, by which the iron tube or poker can, by a piece of flexible tube, be attached to a gas pipe, coming up in the usual way, at the side of the stove or fire-place. The gas poker is thrust into the fuel in the lower part of the grate, the gas turned on and ignited, by which the fuel is brought into rapid combustion, and, when fully ignited, the gas poker is withdrawn."

It is manifest that the construction of the perforated lower end, or burner portion, of this fire-kindling "poker" was quite insufficient for securing the most intense heat of which a gas-jet is capable. But this could doubtless be remedied by applying to the device some modified form of the ordinary Bunsen burner. It is doubtful if anthracite could be very conveniently ignited by an apparatus of this character; but there are several kinds of fuel in common use for which there seems every reason to believe that something of the kind would prove of decided convenience.—*Amer. Artisan.*

The Process of Eveleigh.

[As we have already given some notices relating to this process, we extract further, from the London *Journal of Gas-Lighting*, its present views and conclusions.]

If we are to judge from the sensational advertisements and the laudatory puffs in brokers papers, the "Patent Gas" has need for strong stimulants to prevent its collapse. We have said before that we have examined Dr. Eveleigh's specifications, and have failed to discover anything in them to warrant the exalted opinion of the scheme which would appear to be entertained by speculators in the shares of the Patent Gas Company. Let us recapitulate the chief points in the process. The first is the distillation of coal at a low temperature. It is admitted that there is no novelty in this, but it is asserted that the methods employed have not been commercially successful, in consequence of the small quantity of gas produced. We can readily believe it, and must wait to see whether Dr. Eveleigh is more successful. The maximum temperature mentioned in his specification is one at which, according to Dr. Lyon Playfair—perhaps the most able experimenter of the day—only a little gas and much oil is obtained from coal. We have no knowledge of Dr. Eveleigh's scientific acquirements, and no acquaintance with the methods he has adopted for determining temperatures; but we have no hesitation in saying that we shall place implicit confidence in the results of Dr. Playfair, until they are proved incorrect by a competent authority.

Perhaps the part of Dr. Eveleigh's process which wears the air of greatest novelty, is the mode of purifying gas from sulphur compounds, by passing it through a second retort, heated to dull redness, and packed with chalk, charcoal, and iron filings or turnings. But this can hardly be considered a novelty. It was a plan adopted, if not in the infancy, certainly in the youth, of gas manufacture. For example, there was a patent granted to George Holworthy Palmer in January, 1818, for a then "new mode of purifying gas." This consists in passing the gas made by any of the usual processes to a "purifier kept moderately red hot while in action, to accomplish which it may be set in the same furnace as the retorts, or heated by a separate fire, so as to be visibly red by daylight." This purifying vessel is to be nearly filled with the fragments or clippings of sheet iron, clay, argillaceous iron ore, or cinders, in which undoubtedly the same result happened as takes place in the redistillation and purifying retorts of Dr. Eveleigh's first specification.

Nor can the conversion of tar into gas and the mode of effecting it described be regarded as altogether novel. For in a patent granted to John Grafton, in that same year, 1818, for an "improved process or method of making carburetted hydrogen gas for the purpose of illumination," we find, together with a novelty in the setting of the first retort, a claim "also in employing a secondary retort with feeding apparatus to receive the tar separated from the gas produced by the first retort, and to introduce the tar into the secondary retort, in order to be redistilled into gas." This secondary retort is to be heated to redness, and previously filled with iron filings, or coke, or other substances known which will convert the tar and oil into gas. In these two patents, dated fifty-three years ago, are to be found, we believe, the material points of Dr. Eveleigh's process, and all that can be said to be novel is a cumbrous form of apparatus which few experienced gas engineers would be inclined to adopt.

We have quoted the foregoing specifications because they show the purification and redistillation idea "consummate in its birth," for practically Dr. Eveleigh has added next to nothing to it. A preliminary vaporizing-pan and an intermediate heated chamber may save the redistillation retorts from being choked with pitch, but that is all. The question remains, as we have already said, how much permanent gas is obtained on redistilling the tar. In our opinion, little if anything but condensable vapors are procured. The vapor of benzole held in suspension by a large quantity of gas will, we know, travel a very long distance. Heavier hydrocarbons, which will be volatilized, rapidly condense; and it is still to be ascertained how much gas, and of what quality, Dr. Eveleigh will deliver at the distance of a mile from the works.

Since the patents we have quoted above, numerous inventions have been tried for the conversion of tar into gas, but it is notorious that all have failed. Mr. Basford's process was abandoned, notwithstanding the favorable opinion expressed regarding it by some scientific authorities. The original retort-house of the Western Gas Works at Kensal Green was constructed to carry out Palmer's system somewhat modified, but that also was abandoned. Far be it from us to discourage new inventions and improvements on old processes; but when we see such means taken to give a fictitious value to an invention as are pursued in this case, it is our duty to warn the public against being misled, and to point out that it would be advisable to wait until the system has been fairly tried. We recollect how £60,000 was expended some years since, in trying to make the hydrocarbon gas process succeed, and after all it was found that the gases produced by the decomposition of water, and which gave no light, cost more per 1000 feet than good illuminating coal gas.

Noxious Gases from Sewers.

The illness of the Prince of Wales, said to have been caused by noxious gases from sewers, has called the attention of the English public to the necessity of further sanitary legislation. In a report made to the Privy Council as long ago as June, 1870, on the drainage of Forest Hill, a wealthy suburb of London, the inspector stated that in no instance did he find any proper provision to prevent the influx of sewer gases into the houses, and the house of the Prince of Wales appears to have been equally defective.

The sewage question is assuming importance, not only in England but in this country. Scientific investigation has shown that many diseases have their origin in neglected cesspools and unclean thoroughfares, and that other diseases are rendered more malignant by the presence of unhealthy exhalations from sewers and deposits of refuse. The almost fatal illness of the Prince shows that the deadly miasma may be as prevalent in marble palaces as in the haunts of the poor, and that the question of preventing the influx of sewer gases is as important to power and wealth, as to the struggling laborer residing in a seven-story tenement house.

It is expected that the English Government will announce at the coming session of Parliament, a comprehensive measure of sanitary legislation, putting all matters relating to the public health under the control of a single minister. A movement has also recently taken place in the west of England, which promises to convert sewage from a nuisance to a source of profit. The corporation of Exeter has recently sold to a company, for a large sum, the right of utilizing the sewage of the city, and this example has been followed by other towns and cities.

The United States, and the State of New York especially might, in this instance, well take a pattern after England. The threatened visitation of cholera, in the early part of the fall, excited the health authorities of this city to measures of prevention. A few of the streets received a cleansing, and the Street Contractor, Major Brown, was soundly rated for his neglect of duty. But Mulberry street, Park street, and a number of other down-town thoroughfares, still remain, however, in their old filthy condition. Even on these frosty days the sense of smell is offended by the exhalations from the refuse deposited in the reeking gutters. If we desire to prevent a heavy death rate in the coming spring, prompt and effective measures must at once be employed.—*New York Sun.*

The New York Society of Practical Engineering.

At the meeting (Wednesday eveding, January 3) of the New York Society of Practical Engineering, President James A. Whitney described the practical development of the various systems of pneumatic car propulsion.

The first of these comprises a car driven by atmospheric pressure through a tube or tunnel somewhat larger than itself, as in the Broadway tunnel; but this plan would be best applied in an elevated railroad. A speed of from twenty to thirty-five and forty miles an hour has been achieved with it. The second includes a piston travelling in a comparatively small tube and connected with the train outside. This would answer for large tunnels having trains running both ways. It was tried in France and in Ireland many years ago, and was given up because more costly on ordinary railways than steam locomotives; but with it a speed with freight was had of fifty miles an hour, and a detached car once ran at the rate of seventy miles on air. The third system relates to the use of reservoirs of air compressed to supply the engine of the car in lieu of steam, and much difficulty from freezing is experienced, because the expansion of the air renders latent a large amount of heat which must be returned by artificial warming before reaching the engine—for example, from the stove or heater in the car.

Dr. Gilbert set forth the merits of a double line of elevated pneumatic tubes. Mr. Fisher showed how ordinary coal gas may be applied to the tank system to warming the air on its passage to the cylinders. Mr. Towle explained how a common engineering device—slight inclined planes at stopping places—could

be availed of to aid the stopping and starting of cars on an overhead atmospheric railway, and Peter Cooper gave a graphic account of a locomotive built by him in 1829, the first constructed in this country, and in which the draught in the smoke stack was produced by a screw or system of spiral vanes connected by a band with the driving axle of the locomotive.

A Most Important Discovery—If True.

[On page 6 of the last issue, through an accidental transposition, the concluding (and the most important, because the critical) part of the following item was entirely cut off. We therefore republish the whole in correct form.]

The Portland *Dispatch*, in a late issue, gives the details of a most important discovery, if the statements of that journal can be relied upon. The discovery or invention has been made by Mr. Robert Spear, and consists in a simple device, whereby it is claimed that compressed air can be forced through tubes any required distance without any sensible loss by friction. The importance of such a discovery can scarcely be over-estimated even by an imagination allowed the freest flights. It would bring cheap power to many workshops and households, as gas and water are now brought. Automatic machinery, worked by tidal forces, might supply any city on the sea-coast. A waterfall might furnish the whole region about it with a cheap power for workshops.

To the miners of California such a result would be of incalculable importance, in reducing the cost of ventilation by forcing air through tubes, and in conveying power to drilling machines, which must soon be very generally introduced into tunneling operations.

The device whereby it is claimed all this can be effected consists, as described by the *Dispatch*, as follows:

"The invention consists in the discovery that while in tubes of uniform size, fluids in their passage gradually lose their force and velocity, *by making at short intervals peculiar contractions in the pipe*, the original power is transmitted without loss—absolutely without loss. By using colored fluids in glass tubes provided with Spear's invention, it is demonstrated that the propelled current is kept in the center of the tube without any friction at the sides.

"If by a diaphragm pierced with holes at the sides, this current is forced to divide and seek passage next the inner surface of the pipe, it at once resumes its course in the center after the obstruction is passed.

"He has also discovered that while any angle or bend in an ordinary pipe obstructs a fluid flowing through; *by enlarging the pipe at angles*, the friction and loss of power are overcome. At Mont Cenis and at the Hoosac Tunnel it has been found necessary to greatly enlarge the whole conducting pipe for every mile of distance the compressed air has to be forced. This, of course, seriously increased the expense. Mr. Spear's invention greatly reduces the size of conduit necessary for long distances."

To show the practical value of the invention, pipes constructed with his device have been connected with an 8-horse power steam engine, in Portland, by which it is claimed the power is conducted 480 feet much cheaper than steam can be conducted in the ordinary manner—30 pounds initial pressure of air doing the same work that requires 40 pounds steam pressure.

The value of the above alleged invention might easily be tested at almost any locality, where a steam pump or other air compressing machinery can be had. While it is possible that there may be *something* in it, the claim set up that *all* friction in the passage of air or water through pipes is thereby overcome, and power transmitted "absolutely without loss," is of course preposterous.—*Scientific Press.*

[We insert the above for what it is worth, and shall be glad of criticisms from any of the numerous scientific engineers among our readers,—Ed.]

Alliance and Dublin Consumers Gas Works.

[Our readers will recollect Prof. W. H. Chandler's account of the Dublin Gas Works in our issue of November 2nd. In the following article, on the same subject, from *Saunders's News Letter*, further interesting information is given, Prof. Chandler being also quoted.—Ed.]

Some two or three years ago the Alliance Company became amalgamated with the Hibernian and Commercial Gas Companies, and continued the united firms under the title of the "Alliance and Dublin Consumers Gas Company," thereby having a monopoly for the supply of gas to the city. But we are happy to say that although the new company enjoyed a monopoly, they are now endeavoring to show on a pretty large scale that they deserved it—that if "unity is strength," they are determined to exert it, not only on behalf of themselves, but of the public generally; and, from the arrangements for a better supply of light which we saw in progress, we are rather inclined to think the public will have the advantage. We believe, however, that the company will also be in the end the gainers. Since the amalgamation the new company has had a good deal of up-hill work, and no doubt well-grounded complaints were made of an insufficient supply of gas to the streets and the various extensive gas consumers in town. But when the gigantic character of the work they were engaged in is considered, and the operations they are undertaking to remedy the deficiency, we are satisfied that not only will the public condone the company for past shortcomings, but be so fully supplied as to all their requirements in the future, as to have not the slightest grounds for complaint. This statement is, of course, encouraging, but we make it advisedly, considering the difficulties to be encountered by a new company and the necessary shortcomings that must have resulted from "divided action." We are glad to say that the company is prosperous; that during the half year ending June there was a dividend of eight per cent., free of income tax, declared, the profits being nearly £18,000. The public have had, however, frequent complaints to make, and the company, while doing, we believe, their utmost to remedy short supplies of gas, do bear a good deal of odium, though at the same time endeavoring to use all their resources in the most efficient manner for the public benefit. We have inquired into the cause of occasional deficient supplies of light throughout the city, and ascertained that it has resulted from an insufficient supply of storeage or "gasholders," those belonging to the companies now amalgamated being unequal to the task of supplying the city when an emergency—such as a dark or foggy day—occurred, such as we have had during the present month of November. Nearly 600 men were occupied day and night in the manufacture of gas; but the difficulty was to store it for night consumption, and this is now being obviated by the erection of an enormous gasholder, on ground purchased by the company at Barrow street, near Grand Canal street.

The area of the new ground is about eight acres, and on it is being erected a gasometer, or gasholder, of enormous dimensions, capable of containing 1,400,000 cubic feet of gas, or equal to the supply of the entire city for three hours. It is 184 feet in diameter, and 56 in height, whereas the three gasholders in the station in Great Brunswick street are as follows: Smallest, 50 feet high and 120 feet in diameter; the next, 50 feet high and 130 feet in diameter; and the largest, 54 feet high and 150 in diameter. These are equal to the storage of somewhat over a million and a half cubic feet of gas, or about a quarter of a million more than that which is now in process of completion. The powers of supply on the part of the company will, therefore, be not far from doubled when the new works are completed, and we expect to hear no more complaints then of an insufficient supply as to quantity or quality of the gas. The retort power of the company has always been up to the mark—that is, they could manufacture any quantity of gas they required. The difficulty was that they could not store it until it was required, and when two or three dark November days came upon the city the supply was insufficient. The new gasometer must remedy all this. It will be connected with the present gasholders by means of a 30-inch iron pipe run under the ground from the present works, and which will cross the Grand Canal alongside the bridge by a nice piece of engineering. It will span the canal in three faint bends, supported by two pedestals, and will be continued down Barrow street into the holder. The gasholder is all but completed, and looks a stupendous undertaking, but the piping is not yet laid down. A very short time, however, will suffice on the completion of the gasometer to place it in connection with the works, and allow the company to derive the benefit. It is the intention of the company to charge this gigantic holder during the day and draw from it during the night. It is in direct communication with the present gasholders, and the pressure it will afford can drive the gas to the remotest portions of the city with good effect. The ground on which it stands will be enclosed by a high wall, substantially built. The new gasholder is being constructed by Messrs. Aird and Sons, Lambeth, London, who are more extensively engaged in that line than any other contractors in the United Kingdom. The mechanics are all Irishmen, and the works are carried out under the direction of Mr. Somerville, C.E., the very efficient engineer of the gas company's works at Great Brunswick street, whose courtesy and kindness, as well as his intelligent explanation of the various processes to be gone through before the "fish-light" can be ignited, we have candidly to acknowledge.

The works at Brunswick street are certainly of a stupendous character, covering 15 acres of area, and a visit would be of the most interesting character. As we said before, there are about 600 men employed, in day and night reliefs, for the public must always be supplied, and the work never ceases, though, of course, at night it is carried on rather more briskly than in the day time. These men are paid, for mere laborers, from 14s. to 20s. a week—that is for laborers and stokers—while better workmen are better paid, in proportion to quality and status. Whether the nature of the work is unpopular or not we cannot say, but even at these rates of wages there is a difficulty in getting men, although much is done for their comfort, and more will be attempted that is not thought of elsewhere. The quantity of coal used varies according to the season. There was less in summer than during last week, when there were 2500 tons used, whereas at Christmas it may go up to 3000 tons. The average amount used in the year is 95,000 tons, representing a pretty large figure in cash. The kinds used are Wigan, Newcastle, and cannel coal, and it may be mentioned as an interesting fact that these coals are conveyed from the mines across the Channel in screw steamers; that they are unladen alongside the company's works, and are almost immediately transferred to retorts. It is a matter of very frequent occurrence, therefore, we were informed, for the inhabitants of this city to be reading or writing on, say Tuesday evening by the gas from coal that had been lying for unnumbered centuries in a coal-bed till the previous Monday morning? In fact, it was excavated, shipped, carried across the Irish sea from Wigan, and converted into gas and coke in 36 hours! There is an immense demand for the coke, and all is easily disposed of that can be spared. Of every 20 cwt., or ton of coal, about 13 cwt. comes back in the shape of coke, and of this about one-half is consumed under the furnaces for the engines and retorts, so that about one-third of every ton of coal is sold again as coke, of course at a much reduced figure, but still producing a considerable revenue. The cost of coal at 18s. 6d. per ton must amount, however, to a nice figure, and when to it are added salaries, dividends, material, etc., the expense must rise to something enormous before the first 1000 cubic feet of gas are sent through the pipes.

A visit to the works at first sight has a most confusing effect on the visitor. He is overawed almost with the quantity of smoke and flame, through which numbers of coal-begrimed men are seen hurrying hither and thither in what to him seems hopeless confusion. Drays are bringing coal, and drays are carrying off coke still smoking from the fiery ordeal through which it has passed in the retorts, while in the centre of the large yard men are emptying from iron hand-carts the loads of coke—resembling burning lava—from which the gas has just been extracted. All is noise and bustle, but there is little or no confusion, while to the casual observer there appears to be overmuch of it. The work cannot be gone through without fire and smoke, and noise, and there is abundance of all three, and yet there is an admirable order in the manner of them.

The retort-house, where the gas is manufactured, is a wonder of art, and must present the appearance of a perfect Pandemonium when in full play at night. On both sides of an almost interminable-looking wide corridor or hall the mouths of the retorts are ranged, with a furnace beneath every nine, arranged in rows of three each. These the men engaged in the work—as black-looking as the coal they are handling—are engaged in emptying of the gas-exhausted coal, or filling with fresh, by means of immense rakes for emptying, or scoops for filling, which not less than three men are able to operate with. The iron doors are covered with a composition that hermetically seals them when they are closed, and as they are opened the flames burst forth in awful grandeur, giving the interior of the building a strangely wild appearance—as nearly as possible to poetic descriptions of the infernal regions. This work continually goes on—day and night—every retort having to be emptied and refilled every six hours, and the men can hardly accomplish them all in that time. All day and night long there is a continual hurry of men to bring the coal, to clear the retorts, refill them, and carry off the burning coke. An apartment equally long and equally imposing is parallel to this, and there the same scenes occur day and night throughout the year. There is a second story over each, in which machinery has been called to aid with considerable effect. The arrangement of furnaces and retorts is the same, but on the iron-plated floor is laid down a tramway, on which is a patent "steam-stoker," moved along by a small engine, and directed by a couple of men. This machine moves along to three retorts in which the coal has been exhausted—the doors are opened, and three long rakes thrust in. They draw out all the coke, which falls through an opening of the floor into an iron wagon below. Three scoops are then filled with coal from a hopper above, and these, moving forward into the empty retorts, overturn, and are then withdrawn. Each operation only occupies a very short time—perhaps a couple of minutes. The machine and men mingled in the smoke and flames from the open retorts present a strangely weird appearance. A huge chamber of a similar kind runs parallel to this—both being over the two already described on the ground floor—and it is furnished

with a similar machine, while in each a machine is held in reserve in case of accidents. There are other retort-houses, in which the gas manufacture is carried on in a more primitive manner, according to the old plan. These retorts are wide, and long tubes placed horizontally in three rows, one above the other, and there are about a thousand of them to be attended to four times in the 24 hours. From these retorts the gas is conveyed by pipes, varying from 15 to 30 inches in diameter, into a huge main pipe above, and after passing into which the communication with the fire below is cut off by water ingeniously interposed. These tubes are ever so many miles in length, and the whole of the upper portions of the works in which the retorts are fixed are surmounted with an apparently endless interlacing of them. From the huge tube above mentioned into which the smaller ones discharge their contents, the gas is passed through several purifying processes, the names of which would puzzle our uninitiated readers, until it is finally lodged in the gasholders, and thence forced into the city through various channels for consumption.

The engine-house contains the largest of the kind ever made of Anderson's gas-exhausters, with cylinder 37 inches in diameter by 47 inches in depth. It is capable of passing from 150,000 to 200 000 cubic feet of gas an hour through it. There is also another machine for the same object, by Beales, with two cylinders, one equal to the work of 100,000 and the other of 80,000 cubic feet per hour. In this room are also the gauges, by which the workings of the various processes are indicated, and defects at once ascertained. There is also Lowe's jet photometer improved, by which the exhausters are regulated, and the quality of the gas is corrected. Six inches of flame from the "steatite" jet, 7 inches in height, are equal to 16½ candles, and the pressure is regulated to keep that light steady by an engineer, always on the spot, who keeps a register of the appearance it presents. Then there is the "governor" or "indicator" room, in which is one of the largest meters ever made. When we visited the room, the indicator showed that 140,000 cubic feet of gas had passed through within the last hour into the gasholders. There were six "governors," without which the pressure would force the water out of the meters in dwelling-houses into the tubes, and the gas would be useless. There are regulators, one for each of the following: Pembroke Township, Rathmines, Dundrum, large business offices (such as newspaper establishments, hotels, and public offices), the North City, and the South City. The laboratory is fitted up with all the most recent and most improved apparatus necessary for such a great work as this. The gas is tested, weighed, and measured, and experiments performed that we cannot stop to describe. Special mention may be made of N. H. Schilling's (Munchen) apparatus for ascertaining the specific gravity of gases, which is of recent invention and very accurate. It was manufactured by Messrs. A. Wright & Co., of London.

A day may fairly be spent in examining these interesting and stupendous works without exhausting the material worth examining; but we think we have said enough to prove that the new company are carrying on operations in no niggardly or un-enterprising spirit, and that when the new gasholder is ready for use, there may be no further fears of a bad or insufficient supply of light. The new gasholder alone will cost £18,800, and to this is to be added the buildings and piping which are not yet laid down, from the works in Brunswick street. Gratifying testimony has recently been borne by an independent and competent authority to the excellence of these gas works. In the number for the 2nd of November of the *American Gas-Light Journal and Chemical Repertory*, published in New York, appears an article headed "The Dublin Gas Works." It is written by Professor W. H. Chandler, of the *American Chemist*, who was recently on a visit to this city.

[Prof. C.'s article is then inserted, which our readers already have.]

Gas Explosion in New Brunswick, N. J.—About four o'clock on Wednesday afternoon, the 10th inst., quite a serious explosion of gas took place in Greer's building, on Burnet street, New Brunswick, N. J. In the store kept by Mr. Greer there had been an escape of gas, and the proprietor traced the leak to a part of the pipe where the screw had somehow worked off. A plug was procured and inserted, and then Mr. Greer placed a lighted match near the leak, when bang went everything with a report like a volley of heavy ordnance. All the windows were shattered to atoms and the shutters whizzed across the street, causing the greatest consternation, but fortunately, injuring no one. One of the young men of the store was very badly burt, and Mr. Greer slightly.—*N. Y. Herald.*

Explosion of a Gas Works.—The gas works connected with the Glasgow Gingham Mill at South Hadley Falls, Mass., blew up on the morning of the 8th instant. Mr. Nicholl and Charles Benway were severely injured.

Correspondence.

[Correspondents, in all cases, should sign their communications with their names and address in full—not necessarily for publication, but as a guarantee of good faith.—Eds.

The Recent Explosion at the Metropolitan Gas Works.

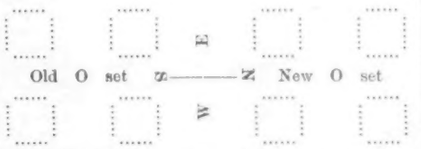
New York, January 6, 1872.

Prof. Henry Wurtz:

Editor of the American Gas-Light Journal.

Dear Sir: In reply to your inquiry, as to the cause of the late explosion at our works, we will state the following facts:

For the purification of our gas we use two sets, of four boxes each, arranged as the following sketch shows.



Under these boxes there is a cellar, in which are the pipes connecting the exhauster with the center seal, also the pipes to and from the purifying boxes. Attached to each pipe, from the purifying boxes to the center seal, is a drip to allow the water or other accumulations to be drawn off.

On the evening of December 23rd, at 5:40 P.M., one William Naher, an employee of the company, working in the purifying house, proceeded into the cellar, under the purifying house, with a dark lantern (which is against all orders), to examine everything for the night, and to see that the drips, etc., were properly sealed and closed. He had entered the cellar throngh a trap door in the house where the new set is, and left the same open. He examined the drips, etc., under the new set and found everything in order, and then went to inspect those of the old set. Here, as he says, he found the drip from the pipe under the northwest box open, which, of course, considerably frightened him, and he at once placed his lantern on the ground, and closed the drip as fast as possible. He had scarcely closed it well, before the gas in the cellar took fire from his lamp, and created the explosion. He ran through the cellar and escaped through Forty-first street, with his hand somewhat burnrd as well as his face; that he escaped with his life is a miracle. The force of the explosion shook down the walls of the purifying house, and they fell on the boxes, bending and breaking six of the covers. The pipes, center seals, etc., were fortunately not hurt. We immediately set a large force of men at work to repair the covers, and on the 27th were making gas again, and by the 29th had both sets of boxes in full running order. We have temporarily replaced the brick building over the boxes by a wooden shed, which will answer all purposes till spring.

Our consumers were without light except that supply which reached them from the Harlem Gas-Light Company, but for four days. We are very thankful also that no lives were lost.

Yours respectfully,
O. Zollikoffer, Pres't.

Answer to S. Trumbore, on Holders Without Internal Frame Work.

Cincinnati, December 26, 1871.

Mr. Editor: We have for a long time past learned to regard your Journal as an old and trusty friend, whose welcome visits we cannot afford to dispense with, and as a rule, we lose no time in culling the valuable information every fresh number contains; but through some inadvertence we omitted to notice, until to-day, a communication signed S. Trumbore, in your issue of the 16th inst., which at first sight, seems to reflect on our carefulness, our integrity, or our ability—whichever you please—as builders of gasholders.

Mr. Trumbore is opposed to holders without internal frame work, and to strengthen his argument, referred to the "two explosions, *as they were called*, at Cincinnati," as owing to the absence of internal frame work, or to some defect in the construction of the same. Now, as we built these holders, we simply wish to inform Mr. Trumbore that he is mistaken; *both holders were supplied with internal frames of extra strength.* It is not necessary, neither would you permit us to occupy valuable space in your paper with a description of the material used, but we beg to refer Mr. T., or other interested parties, to the identical engineer he quotes, or to the Cincinnati Gas-Light Company, or to all of the Committee of Investigation, for information as to the quality of the material and workmanship in both holders.

We are not in the habit of "puffing" our work, preferring rather that our reputation depend on visible and practical illustrations—which are not difficult to find throughout the West; and we have not written this letter to set us right with friends who know us, but rather (as we are making new friends every day) to disabuse the minds of those who do not know us as yet, from any lingering prejudice they may have imbibed from the perusal of Mr. T.'s article. We have none but the kindest feelings toward Mr. T., but hope, in future, he will *make sure of his facts*, before he rushes into print.

Yours most respectfully,
George Stacey & Co.

The Recent Gas Explosions.

Knoxville, Tenn., Dec. 30, 1871.

Mr. Editor: There have occurred two disastrous explosions of gas within a month of each other; one at Leeds, England, where the engineer of the works and two men lost their lives, the other at the Metropolitan Gas Company, New York, fortunately without the loss of life. The cause of the explosions in both places was the same—a leak and consequent accumulation of gas in the purifying house. I say consequent, because there seems to have been no provision made at either place for allowing the escaping gas to make its way to the open air. Now, sir, I wish to know the reason why purifyers are enclosed by walls, doors, and windows. If a leak occurs (and it is the most likely place in a gas works for a leak occurring), the gas fills the house—there is no means for its exit; it finds its way (as in the case at Leeds) through an open door in the interior of the building, to the lights in the engine house, and explodes. Now, why cannot the purifiers be placed in the open air, under a shed, open all round, the roof resting on pillars only; then if a leak occurs it can do no harm, because the escaping gas is not confined.

It might be urged as an objection to this arrangement that the water in the purifiers and syphons would freeze in the winter, but I think that objection could be overcome by a judicious application of steam, or by using a liquid that would not freeze. I think under the circumstances it becomes our duty to think of and adopt some other than the existing house arrangements for purifying. I should like to have the opinion of the gas fraternity on this subject, in the absence of any Gas Engineer's Association. We can only use for that purpose the columns of your Journal, which you so kindly place at our disposal. Respectfully,

Gas Engineer.

Mr. Gwynn in Answer to Mr. Keeling.

Tiffin, Ohio, January 4, 1872.

Mr. Editor: I had supposed that Mr. Keeling had received his quietus, but it seems with an obstinate pluck (his only good point) he invites further castigation. This will surprise others, as much as myself, after your very candid statement that "you published his letter only to prevent its going where the fraternity would have no opportunity to rebut" his bold misrepresentations.

To any man of keen perception, that alone would have been enough; and it does not impress us as an exhibition of intelligence that it should escape him; but Mr. K. does not desire "to be blotted out from literary fame." He need not fear, his fame is an accomplished fact, and his last letter will not detract from it in the least, and the fame of the writer of this sentence should be immortal (from his first paragraph) "the lion but a mouse, for excepting personal abuse of me, and childish nonsense on the question, it appears to me there is little to add to my former communication."

I think if he would abuse himself, as he thus seems inclined to do, he might see his folly, but let us beg him *not* to add any more "childish nonsense."

Happy ignorance of your correspondents—"they do not understand the rules that govern *respectable discussion*," hence. "they put a whip in his hands to flagillate themselves with,"; but lucky, lucky men: they have at last found a man, whose magnanimity is equalled only by his profound knowledge, for thus saith the sage; "but out of pity for their ignorance, I will take no advantage of the breach." We are thus

spared the scathing that he could have administered, if he would; he is not angry, only full of pity for those who question his arrogant dictum.

Further "he is amused that these mighty men of the far West, take water so deeply from an Englishman." Let me tell him, as an Englishman, born and bred, that he brings shame on the name by such an exhibition of folly and weakness as his letters show; and if his own personal respect will not restrain him, let his national pride awaken to keep him silent; at least until he more thoroughly informs himself.

I do not propose to try any further argument with Mr. K.; it is utterly futile. *His style* is so *original*, that before we can hope to combat *his arguments*, we must acquire *his style*. Therefore I venture to say he will hold the field against all comers for some time.

As for his Pressure Indicator, etc., I have not had, nor have I now, anything to say; but I do want to know about that invention of his that will dispense with stand, dip-pipes, retorts, and those little things at present so necessary to the retort house. One thing more and I have done. His last paragraph says he cannot get light at his place, because they take double out of the main that is put in it; "the draught on the main is double the supply." Can we not get that secret out West (very profitable)?

—Mr. Editor, you must excuse me for once, in taking up your space with such a letter; so different from my usual matter-of-fact style; but the old adage, that "you must deal with a —— according to his folly," must plead my excuse. I promise not to repeat.

Yours respectfully,

MACHINIST.

On the Removal of Impurities from Coal Gas.

By P. INNES, Gas Works, Forfar.

[Prize Essay read before the Meeting of the North British Association of Gas Managers.

[Continued from page 5.]

Carbonic Acid.—The gas having the formula CO_2, and known popularly by this name, is not like sulphuretted hydrogen, an acid in the dry state, but a double oxide of carbon. It is only when it dissolves in water, or meets any other substance in a moist condition, that it possesses acid properties, and forms carbonates. It is produced in many ways, such as by heating any of the carbonates, as in the burning of limestone, during fermentation, and largely by the combustion of carbon, or of any substance containing it, such as wood, tallow, coal, or coal gases, in oxygen, or in the air which is merely a dilution of it. It is likewise produced by the distillation, at high heats, of carbonaceous substances containing oxygen, and such is the method of its production in the manufacture of coal gas.

Carbonic acid is heavy, so much so that it can be poured from one vessel to another like water; its sp. gr. is 1·52, or one half heavier than air, or three times the ordinary weight of coal gas, and from this fact it will be seen that the density of coal gas is no criterion of its quality if it contains any of this impurity. It is incombustible and irrespirable, and it is found that illuminating gas, containing 1 per cent. of carbonic acid, loses 5 per cent. of its illuminating power. It combines readily with all alkalies, moistened or in solution, especially with potash, and on that account is that absorbent adopted in eudiometrical analyses. Its removal from crude gas is invariably effected by lime, and in the purified gas it is detected by lime water. In solution its presence is likewise shown by effervescence when treated with a strong acid. The compound of it with ammonia we have already mentioned. Like the other impurities which we have spoken of, carbonic acid is soluble in water to the extent of about one volume of the gas in one volume of water, but combined with ammonia that property is greatly increased.

Bisulphide of Carbon.—Carbonic disulphide, or for a similar reason to which carbonic dioxide is called carbonic acid, so this substance is termed sulphocarbonic acid. The vapor of this substance, which is a dense volatile liquid of a peculiarly unpleasant odor, is produced whenever the vapor of sulphur is passed over red-hot carbon or coke, and such is the manner of its production in the retort when carbonizing. When a charge of coal exhausted of its hydrocarbons is allowed to lie in the retort any considerable time afterwards, the coke, which is then in a red hot condition, will expel a further portion of the sulphur—which the iron in the coal retains in moderate carbonization—in combination with carbon as bisulphide, and thus unnecessarily increasing the amount of this difficulty of absorbed impurity in the purified gas. The quantity of this impurity which is produced during carbonization, we believe is greater than is supposed, especially in earlier parts of the process of distillation; but on account of some reactions it has with ammonia, and other decompositions, it is converted into sulphuretted hydrogen and other absorbable impurity, except near the end of the distillation, when no ammonia occurs. As its removal from coal gas is a subject which is constantly exercising the attention of gas engineers, we may bring forward a number of its properties and reactions which modern chemistry has brought to light. The density of the vapor is 2·67, or 2¾ times the weight of air, or nearly six times the weight of ordinary coal gas. It is soluble in alcohol, ether, and most oils, but is insoluble in water. The vapor is very inflammable, producing, in its combustion, sulphurous and carbonic acids. It is decomposed in several ways, as by passing the vapor over metals and metallic oxides at a red heat, producing a metallic sulphide in addition to the products of combustion. High-pressure steam at a temperature of 300° Fahr. decomposes it, yielding sulphuretted hydrogen and carbonic acid. Passed over red-hot copper, it produces sulphide of copper and marsh gas. We observe that these last two reactions have been taken advantage of in a patent lately taken out, in which it is sought to improve the illuminating properties of coal gas and remove impurity by passing the impure gas "through a coil of metal pipe, by preference of copper, heated to redness, or through other highly heated passages or chambers, in order to raise the gas to a high temperature before entering the purifiers."

Superheated steam is also proposed in the specification to be "combined with the gas as it issues from the retorts into the hydraulic," etc., etc., the object being apparently to decompose the bisulphide of carbon into an absorbable form. The passing of the gas partly cooled through a red-hot copper pipe, although it might produce marsh gas and a metallic sulphide in breaking up the bisulphide, would be more than counterbalanced by the loss in decomposed hydrocarbons. But we have long considered that the use of steam at a high pressure might be adopted to some advantage in the purification and improvement of coal gas in its illuminating properties, not so much in breaking up the bisulphide of carbon, as in replacing the water of distillation in the gas of which it was deprived in passing through the hydraulic, and thus again using an agent eminently fitted, in a form and in quantity, to search out and retain those impurities which have so decided a preference for it. With nascent hydrogen the bisulphide of carbon produces sulphuretted hydrogen and another sulphur compound, a reaction which probably takes place near the end of the distillation. The sulphides of the alkalies combine with this impurity, forming sulphocarbonates, and from this reaction can the real sulphocarbonic acid be formed.

It is also by this reaction that washing crude gas with ammoniacal liquor in scrubbers or washers is expected to remove the bisulphide of carbon. Dr. Letheby tells us that this impurity acting on the ammonia in purified gas produces there sulphuretted hydrogen and sulphocyanide of ammonium, and in this way accounts for the cyanogen compounds found in meters and distributing apparatus generally.

There are several tests for bisulphide of carbon, but difficult in their manipulation. They mostly depend on the solubility of the impurity in alcohol or ether, distinguished by their solvent action likewise on phosphorus, iodine, or compounds of these substances, and the colors produced on the solution and on the yellow precipitate it gives when a solution of it in alcohol and potash is treated with a copper salt, etc., etc.

The Methods adopted for the Removal of the Impurities.—In considering the removal of the impurities, we shall confine our remarks mainly to ammonia, sulphuretted hydrogen, and carbonic acid. For obvious reasons, ammonia is always sought to be removed before entering the purifiers. The amount of this impurity in the crude gas, when it gets that length, appears to be variable, and must be so, according as the condensation is effective or not. Dr. Letheby informs us that not more than 1 volume of the impurity in 1000 volumes of the gas should enter the purifiers; while a French professional tells us that from 2½ to 3 grammes in the cubic metre in summer is the proportion. This last quantity is equal to from 3 to 6 volumes in the 1000. One cubic foot of ammonia, as we have learned, weighs 331 grains, and allowing 10,000 cubic feet of gas per ton of coal, and also aware that to convert the ammonia into sulphate requires three times its weight of strong sulphuric acid, the simple calculation,

$$\frac{3310 \times (3319)^3}{7000} \text{ grs.} = 1{\cdot}9 \text{ lbs.},$$

tells us that ammonia has been lost in the purifiers sufficient to produce nearly 2 lbs. of sulphate per ton of coal, when 1 volume per 1000 has entered the purifiers, and 12 lbs. per ton by the Frenchman's highest estimate; a very nitrogenous class of coals these last must certainly be. There can be no doubt, however, that in small works with defective condensing and absorbing apparatus the loss of ammonia is considerable. As neither lime nor oxide of iron have any chemically-absorptive influence over ammonia, it is clear that, with the exception of what is mechanically suspended by these agents in the purifiers, this impurity, to a considerable extent, will pass into the gasholders and mains. Let us try to follow the course of ammonia through lime, where this alone is used for purification. When it meets the lime it may be in the free state, or as the various salts of it held in suspension by the water vapor. When these salts touch the lime, whether on the surface or swept within, they are decomposed, forming similar or compound salts of lime, liberating the ammonia. The reaction generates heat, and produces water in the form of vapor, in which, and that with which the lime was slaked, the liberated ammonia is absorbed. As there is always an abundance of free carbonic acid and sulphuretted hydrogen, a portion of the liberated ammonia is again taken up by these acids, forming vaporous salts again, which, with the other gases, are carried deeper into the lime and subjected to another decomposition similar to the first. This reaction goes on as the lime gets fouled, only that the amount of free ammonia increases on the passage through the lime, while that of the salt vapors diminishes. When the surface of the lime gets fouled, and, as usual, tarry matter collects there, the ammonia impurities swept on to it adhere and accumulate there to some extent.

On opening a purifier which has been fouled, for recharging with lime, and in which the impure gas goes down through the lime—as in our own—the pungent odor tells us at once that ammonia is detained by the lime, and that the amount is greatest on the surface may be ascertained by quickly slicing off the upper part of it, when the ammoniacal odor is greatly lessened. Passing downwards to the second tray of lime, we find the smell of ammonia from its surface very faint, that of sulphuretted hydrogen predominating, and so on through the extent of purifying material. The water vapor produced by the chemical action of the impurities on the lime, and that also from the slaking of the lime, is absorbed by the gases and impurities heated on their passage through it, and being quickly reduced in temperature on entering the connexions underneath the purifiers, is there condensed, charged with impurities similar to what occurs in the condensers. This water varies in strength from 1° to 3° Twaddle, and also the amount of each impurity it contains according to the condition of the lime at the time it is drawn off, and is an instance on the small scale of the efficacy of water in the vaporous condition for absorbing impurity.

While much of the ammonia is thus mechanically withdrawn from the gas, there is still more than is desirable, especially in this utilitarian age, escapes absorption, and passes on with the otherwise purified gas. To absorb this, with other impurity, before it enters the purifiers, in a manner suitable for utilization, the history of coal gas manufacture abounds in numerous methods proposed or adopted for effecting this purpose. These may be divided into four classes, in most of which more or less of sulphuretted hydrogen and carbonic acid are simultaneously absorbed.

1. The simple absorption of ammonia by water.
2. The absorption of ammonia with other impurity by increasing the amount of alkaline impurities in the process of washing or scrubbing with sulphuretted liquor or with aqueous ammonia.
3. The absorption of ammonia by a dilute acid.
4. The absorption of ammonia and sulphuretted hydrogen together by a metallic or alkaline salt, in the dry state or in solution.

The first of these methods is based upon the solubility of ammonia in water, and is effected in washers and scrubbers. In the former of these apparatus, now little used, the gas was passed in sheets or large bubbles, underneath a broad surface of water, which, acting on the outside of these bubbles, led to a condensation and absorption of impurity and tarry matter. This first application of the principle of absorption by water was a rude one; the sudden contact of the gas with the cold water in such masses, more especially in winter time, must have been the means of liquefying much of the illuminating vapor by the rapid reduction of temperature. It was imperfect in its action likewise, as the interior of the gaseous bubbles was unacted upon, and so the greater part of the gases escaped the absorbing influence desired. In addition to this, the pressure it relieved on the retorts in small works, where no exhauster was used, was a decided objection to it. The next improvement in its application was in employing it in coke, or other kind of scrubbers, in the form of a shower, the water being introduced at the top, and, by means of distributing apparatus, met the ascending gas in a more searching manner than in the washer. A still better and more natural form of application is what is called the Goldsworthy Gurney jet, which, by driving the water into a fine spray, gives it a still greater intimacy with the impurities for absorption. In the washer, the liquor obtained would be somewhat similar in strength to that in the condenser-chest or in the scrubber and spray jet, on account of pure water in great volume being employed, the resulting liquor would be of little value owing to its weakness. Had the scrubbers

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JAMES R. SMEDBERG, Consulting Engineer, San Francisco Gas-Light Co., Cal. [234-

ployed before the gas entered the condensers, and the warm gas treated with spray in the form of steam, a different result would undoubtedly have occurred. A desire to have gas liquor in a more concentrated form for carriage, the knowledge of the fact that alkaline sulphides can decompose bisulphide of carbon, and that washing with gas liquor already saturated with hydrocarbons will accomplish these ends, bring us to the second class of processes, which have for their object—

The absorption of ammonia, with other impurity, by increasing the amount of alkaline impurity in the gas.

[To be concluded.]

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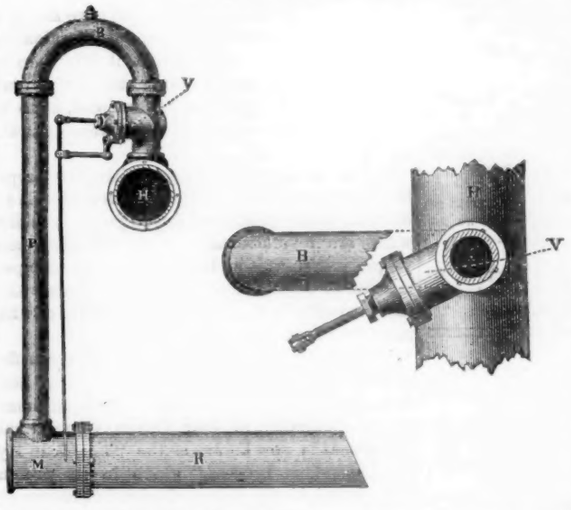

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TUESDAY, JANUARY 16, 1872.

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AMERICAN HYDROCARBON GAS.

"I am Sir Oracle, and when I ope my mouth
Let no dog bark!"

In this issue we have copied (as we often do, on account of their frequent real value) one of the critical oracular utterances of one distinguished and venerable contemporary, the eldest born of our editorial gas-fraternity, the great London *Journal of Gas-Lighting*. We speak with all the deference and respect justly due, though so far is that Journal from acknowledging its humble relatives, that it is in the habit of altogether ignoring our existence, and, in spite of reiterated requests, will not *exchange;* so that, as we confess it to be indispensable to us, we have to buy it, a thing which we luckily cannot well be debarred from.

Dogs *will* "bark," however, and on this occasion we must venture to do so.

It is the statement in the last sentence of the passage quoted, relating to the manufacture of gas through the decomposition of steam by carbon, that especially excites our ululations on the present occasion. At this moment we have not before us the records of the English experiments on what was known there as "Stephen White's Process," made under the direction and supervision of such eminent men as Clegg, Frankland, Fyfe, Barlow, etc., etc., but if the fact was as stated in our present extract, that it was on that occasion "found that the gases produced by the decomposition of water, and which gave no light, cost more per 1000 feet than good illuminating coal gas," we can only say that it falls upon us to show that American investigators and inventors in this field have gone so far ahead, as to be able to laugh to scorn any such statement as the above.

In fact, we have been long awaiting the proper time to bring forward the very remarkable results of these American investigations; results which are revolutionary in their tendency—and we propose to wait no longer, but to assume permission to state at least a few facts, from which the gas public can judge of the character of what is yet to come.

The present editor of this Journal spent five months, from December 1868 to April 1869 both inclusive, in co-operation with Prof. B. Silliman, in experimenting, at Fair Haven, Connecticut, upon what is now known as the "American Hydrocarbon-Gas Process," which in its present form comprehends the combined improvements of several inventors. Water-gas, made from incandescent steam and anthracite coal, in clay retorts, is here used; we made, in all, more than half a million feet of such gas, analyses of which, by Silliman and Wurtz, have already been published in this Journal (vol. xii, page 67, table iii). During our work at Fair Haven, such exact records were kept, that we were enabled to figure out the exact cost of the gas, freed from carbonic acid and sulphur, and consisting of about one-third carbonic oxide, and two-thirds hydrogen, with a little marsh gas. Every item included, anthracite (then very high, $8 per ton at New Haven), coke for fuel, lime, labor, administration, taxes, repairs, interest and incidentals, this half million of anthracite gas cost at the rate of 28 6-10th cents per thousand. We venture to assert that in a continuous manufacturing way, on a larger scale, 25 cents per thousand would amply cover it. The enrichment of such gas with naphtha gas, such as is made under the Gale patents, now owned by the "Gas-Light Company of America," looks to us as worthy of consideration.

We can also state that at Fair Haven, each anthracite retort, holding charges of 600 lbs., yielded at a rate of 7000 feet per 24 hours, with a consumption of 90 lbs. of anthracite, or at the rate of 7.78 feet per pound.

From these figures, our practical readers are left by us to judge of the cost of "the gases produced by the decomposition of water" as compared with that of "good illuminating coal gas," in America at least.

THE METROPOLITAN EXPLOSION.

It will be found, on examination of our correspondence columns, that an application on our part to Mr. Zollikoffer, the President of the Metropolitan Company, for authentic information about the late disastrous explosion, has been met by that gentleman in a courteous spirit; and for the full, concise and candid account he has sent us, we render him our thanks. The explosion appears to have been, in origin and history, almost identical with the Worcester case, an accumulation of an explosive mixture in the cellar of the Purifying House, and the incautious introduction of a naked light into a place where no gas manager should ever allow anything short of a *safety-lamp*, of the most approved construction. We have no comment to offer further.

Among the correspondence will be found also a communication signed "Gas Engineer," referring to this case, and making some suggestions. We shall hope to get some critical opinions on these points from other gas engineers; but in the mean time would ourselves throw out an inquiry or two. In our climate, would not the throwing open of the purifying boxes to the open air, even if non-freezing liquids be used for sealing, lead at times to a too great condensation; and if steam be used, would there not be danger of *desiccation* of the contents of the boxes, and stoppage of purification?

It appears to us that *close cellars* to Purifying Houses are at least not indispensable, and as to the purifying room itself, either thorough ventilation, night and day (by warm air, when necessary) should be enforced; or all the men having access, should be *under bonds* to use safety-lamps, in perfect order. If the safety of their own bodies and bones (as in the case of miners) will not deter them from plunging into Phlegethon, let their *pockets* be interested in the result.

SEWAGE—DRAINAGE—DISINFECTION.

These are subjects that come within the province of this Journal, which are destined soon to loom up into more and more, importance. We should, therefore, give occasional notice to them, though the time has, in this country, scarce come, as yet, for us to appropriate much space thereto.

We give, in another column, an item on the subject of sewage emanations, believed to have caused the recent dangerous illness of the heir to the British throne. This is a subject certainly not without its vital importance in our own cities, and connected with that of disinfection. To show the need of discussion on these matters and the very unsettled and unsatisfactory state of popular opinion thereon, we shall refer to a recent communication to the French Academy by a medical gentleman named Pigeon, relating to the putative powers of *carbolic acid*. This, through the former efforts of several Frenchmen to introduce it into commerce, under the names of "*acide phenique*," "*phenol sodique*." etc., etc., and more recently through the sweeping conclusions of an official report on the cattle plague, by

Crookes (the "psychist"), had come to be thought a sort of sanitary *alkahest*, or universal resolvent of infectious matters. The statements of Monsieur Pigeon, if reliable, put the subject in quite a new and even startling light.

This gentleman points out that not only do cases of cholera and small pox *originate oftener* in hospitals, the atmospheres of which are kept constantly impregnated with vapors of carbolic acid, but that, according to his own special observations, "those cases of cholera and small pox which originate in hospitals in a carbolic atmosphere are generally more grave and fatal," and gives as his "formal opinion" that "far from being a preservative against the original causes of these two diseases, carbolic acid acts as an assistant thereto," adding that he has consequently practised advising his patients in Paris to disuse it in their houses. (*Comptes Rendus*, June 5, 1871, page 680.)

So much for disinfection at present. Our little remaining space we shall give to a subject now occupying much attention from some scientists in this country. This is that of the so-called "earth-closets," the use of which it is claimed will accomplish many things, giving us cheap and valuable manure, preventing the introduction of offensive matters into sewers, and in towns and country places preventing the poisoning of wells and streams by soakage through porous soils, a most fruitful cause of disease, as we readily believe.

It is claimed that the use of metallic salts, which at least deodorize excrementitious matters, renders them unfit for manure, and that hence the earth-closet system is preferable. We reply that the tendency of investigation, as we have read the record, so far is not in favor of the earth-closet system, when the products are to be used as manure. We are at a loss to see how, in this system, the destruction or removal of the disease-germs, as those of cholera and typhoids, which, as now accepted, accompany the excreta of mankind, and are transmitted thereby, is accemplished. Ordinary sewage, at least in most large American cities, transportsthese peculiar and mysterious poisons quickly into a medium in which they are diluted homoepathically, and doubtless die or are devoured and digested by organisms which are tolerantof them. Space fails for more at this time.

THE UNEQUAL SUPPLY OF THE METROPOLITAN.

The newspaper Scribes (as well as the Pharisees) appear at present to have lost sight of the subject which occupied them so much last month, that of the embarrassments, and inequalities of flow in the mains, of the Metropolitan Company, in their newly-settled up town districts where, as we already remarked, last month, the population has increased so fast and so unequally, that it must be impossible to equalize or regulate the supply; except by laying new mains, which it would be ridiculous to expect them to do at this season. The new "sensation" of the explosion has obliterated, for the time, the old one, and other and more available sensations follow so rapidly that there is danger that no good, after all, will come of the ephemeral excitement that was created. In this issue we have taken a long article from a Dublin newspaper, which gives a minute and highly interesting account of the famous gas works there, and from which it appears that notwithstanding all possible efforts, similar difficulties have been largely experienced in connection with these Works.

To fortify some of our own views on these subjects, we shall add a few sentences from (a newspaper report of) a lecture recently delivered by Prof. Chandler, on "Combustion," with much of which we concur, in a measure.

He says that the New York companies furnish gas of excellent quality. He has tested all except the Harlem, and found a better average than is considered necessary as a standard. He gives three causes of complaints, only one of which can be removed by the companies.

First—The pressure is necessarily unequal; strong near the works and weak at the further end of the supply pipes. A moderate pressure, however, gives a better light than a heavy one, and the sufferers by unequal pressure include those nearest the works.

Second—The main pipes in the upper part of the city were laid when there were few if any houses on the streets, and were made little larger than was necessary to supply the street lamps, being three inches in diameter.

Last but not least—bad burners.

* * * * * * * * *

As to the pressure, perhaps more works at less distances will remedy that. The companies should replace the three-inch pipes. They are bound to use all means to furnish their customers enough gas; and to supply streets, with a dwelling on every twenty-five feet, through pipes intended for only the street lamps is, of course, an absurdity. As to burners, every consumer must take care of that matter for himself.

KINDLING FIRES BY GAS.

The *American Artisan*, that sterling technical journal, to which we are so often indebted, furnishes us to-day an item, headed "Gas Pokers," on which a few words of comment may be instructive. The invention he refers to, and which he very well describes, is that patented in England, December 12, 1854, by George Henry Bachhoffner. In this connection, we quote from a pamphlet published in 1870, by John Campbell, of Glasgow, called the "Gas-Light Manual":

"House fires can be kindled with gas by means of two Bunsen or ordinary burners, connected by an india-rubber tube to the gas-pipe, in twelve minutes, at a cost of one-tenth of a penny. The coals have merely to be broken up, and the burners applied. Neither paper nor wood are required, and the hands need not be soiled."

There can be no doubt that in towns where bituminous coals are in use, such methods could be much more readily made available now than in 1854, as flexible caoutchouc tubes are now so attainable. With anthracite coal, however, the Bunsen burner, unless of immense size and power, fails altogether, in the very cases where it is most important, those of cooking stoves, its flame being so readily extinguished by a body colder than itself, that it cannot penetrate through the grate, or even through the fuel itself. A quite different arrangement is necessary to meet this case, and the writer may add, without going into particulars at this present time, that he has himself been engaged upon such a plan, his principle being the combination, in various simple ways, with a gas jet, of a jet of air, making what may be called a *Gas Blow-pipe Kindler*, the power and rapidity of action of which, even in case of anthracite, are surprising.

THE AMERICAN EXCHANGE AND REVIEW.

This is a journal of high merit, and one from which we often quote. Lately a greater renewed interest, for ourselves, which should extend to our readers, has attached to this publication, from the connection therewith, as Scientific Editor, of Dr. C. Elton Luck, formerly Editor of our journal, now resident in Wilmington, Del.

Dr. Buck, whose familiarity with gas matters, as may readily be believed, is extensive, has in his last issue (January, 1872), an extended article, chiefly historical, upon gas, from which we shall in our next, cull some large portions, regretting that we find no space now. Doubtless Dr. Buck will follow up with further articles on gas illumination, than which we conceive he could not do a greater service to the large and highly intelligent class that forms the circle of his readers.

Errata.

Two or three tricks of the types that occur in the issue of December 16, it may be well to point out.

In the note to Excerpt No. 121, a line was omitted: after the words "as in a *blush*, for example," there was written: "which affects the circulation, and through this, the temperature," and so on.

In the article headed Grahamite, on the editorial page, near bottom of column, a whole word *asphaltene*, in italics, dropped out, leaving blank space.

AN ESTABLISHED FACT.

That the Gas Screens manufactured of Oak and Interlaced Rattan, will allow the *same quantity* of Lime to purify *one hundred per cent more* Coal Gas than any other Gas Screen yet invented.

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John Andrews, of Chelsea, Mass., says: "They will purify *more* gas, with *less* pressure, than any Screen I know of.

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They are the strongest Screen manufactured, except all Iron, and are made of best Oak frames, with round tenent and mortice, fitting exactly, the Rattan being braided when wet, so that it holds and strengthens the frame every way.

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James F. Rogers, of Jamaica Plain, says: "The Trays ordered by this Company, *three years* ago, are somewhat worn. Please make another set, etc."

We refer to over one hundred Gas-Light Companies now useing them, and some of them the *largest Gas-Light Company*, in the United States.

They are used in the following States: Maine, New Hampshire; Massachusetts; Rhode Island; Connecticut; New York; Michigan; Pennsylvania; New Jersey; Maryland; Illinois; Tennessee; Louisiana; Georgia; South Carolina; Missouri; California; Kansas, and are fast being introduced into every State in the Union, with a wonderful unanimity of approval over anything heretofore used.

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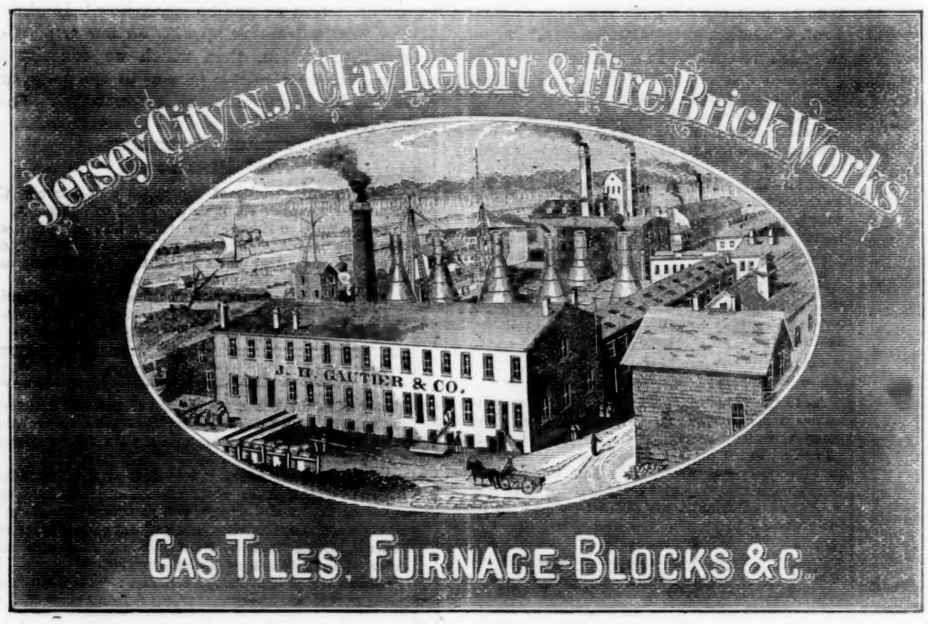

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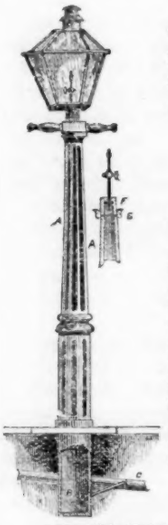

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Sec'y Wooster Gas-Light Co.

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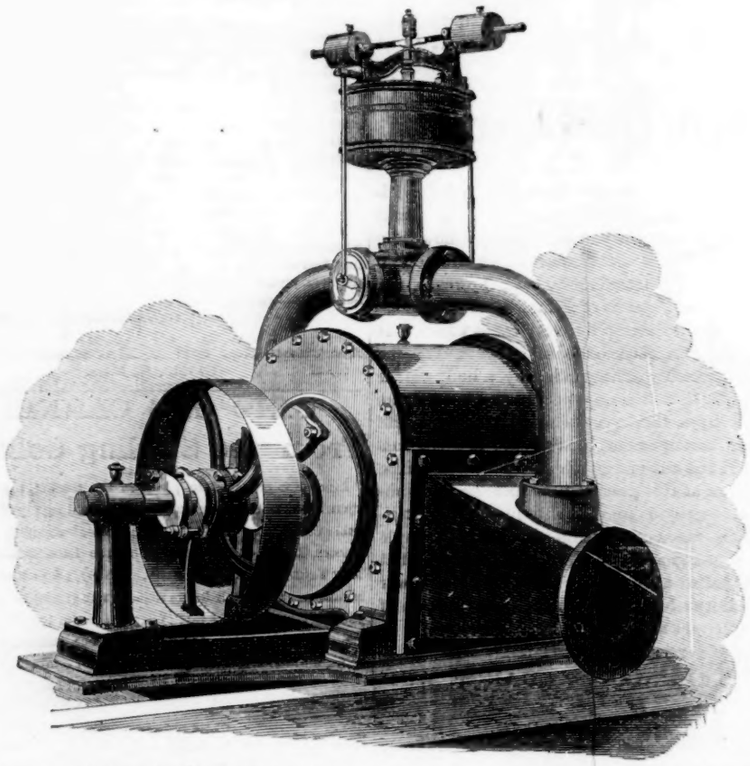

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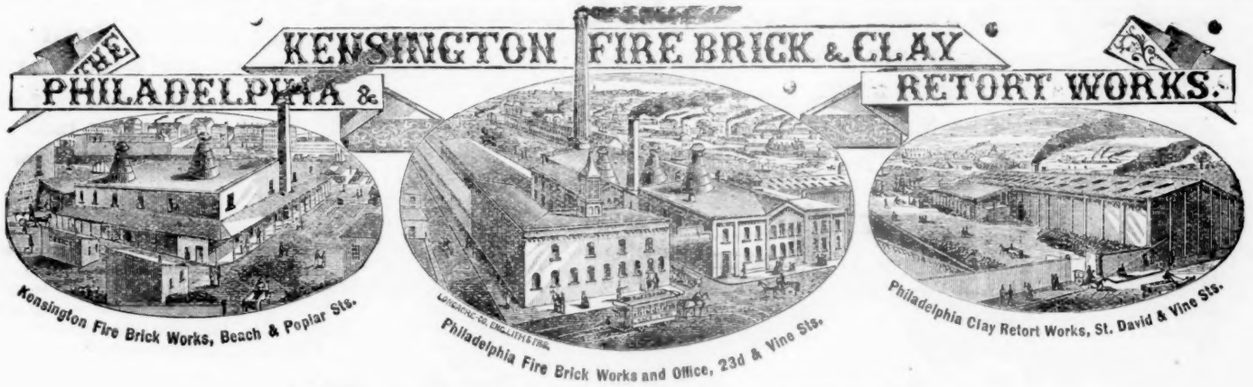
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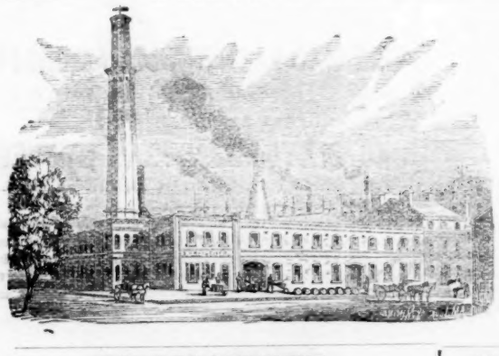

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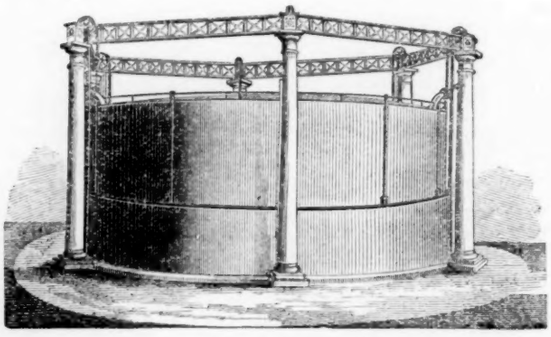

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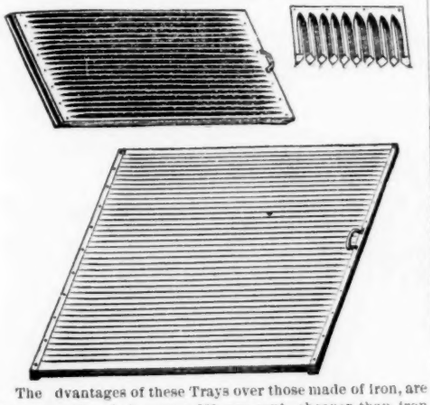

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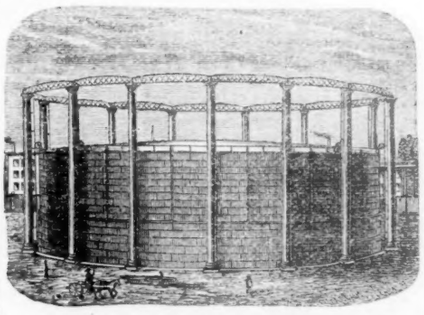

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"Superintendent Water Works.

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"JOHN J. STEIGER, Sup't."

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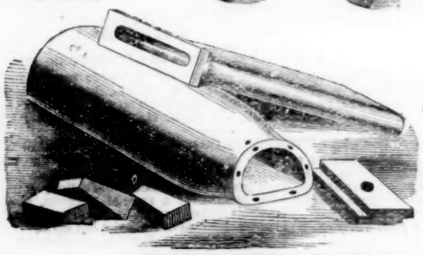

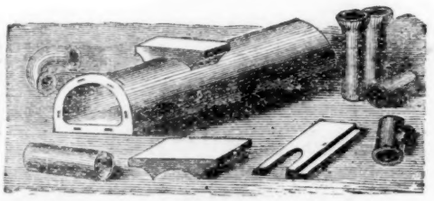

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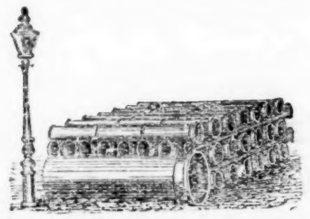

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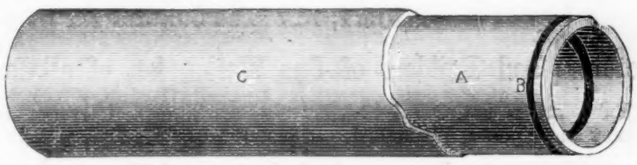

FIG. 2.

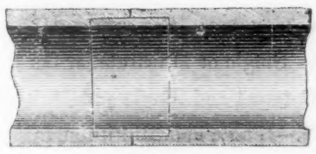

FIG. 3.

A—Cylinder of Wood. B—Band of Iron. C—Coating of Hydraulic or Asphaltum Cement.

FIG. 2.—Thimble for Connection. FIG. 3.—Horizontal Section and Connection.

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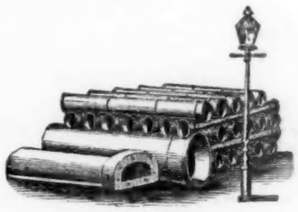

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